

MONTHLY WEATHER REVIEW,

DECEMBER, 1874.

WAR DEPARTMENT,

Office of the Chief Signal Officer,

DIVISION OF

TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE

INTRODUCTION.

The meteorological data collected in this office during the month of December has been carefully examined, and a general summary of the several elements is given in the accompanying charts and tables. The stations of observation are so distributed as to give the meteorological condition of that portion of North America lying between the twenty-fifth and fiftieth degrees of latitude, and extending from the Atlantic to the Pacific. The following are the sources from which reports have been received: Canadian Meteorological Service 12. United States Army Surgeons 36. United States Naval Hospitals 2. United States Army Signal Service 87. Regular Volunteer Observers 264.

In addition to the above, marine reports have been received, which have proved of special value in the study of storms which have passed to the eastward off the Atlantic coast beyond the regions of permanent stations. By means of these reports the most severe storm of the month—that occurring on the 19th and 20th—is traced to the fifty-fifth meridian west of Greenwich, fifteen hundred miles east of the middle Atlantic coast. The increasing severity of this storm, and the desire to trace it through its entire course, led to a telegram being sent from this office to the Director of the Meteorological Office, London, on the 23d instant, to the effect that the storm had left our coast on the fortieth parallel of latitude, moving to the eastward. A detailed description of this storm will be found in the text.

The most noticeable features of the weather of December are—

First: The mean temperature, which has been above the mean of previous years, and differs but slightly from that of 1873.

Second: A deficiency in precipitation in all the districts east of the Mississippi river and in the Northwest.

Third: An excessive precipitation in the Southwest.

Fourth: The unusual low temperature and excessive precipitation in New Mexico.

BAROMETRIC PRESSURE.

A comparison of the mean isobarometric lines on Chart No. II, with those of the preceding month, will show that the area of mean high barometer has increased both in extent and intensity. This area now extends over the southern portion of the United

States, extending from the lower Mississippi valley eastward over the Atlantic, with its centre near the coast. The area of low barometer continues central north of the Lake region, and a second depression has developed rapidly in the North Atlantic, immediately east of New Brunswick. Compared with December, 1873, there is no marked variation, both months showing an excess of pressure over the mean in the districts south of the Lakes. The pressure has increased rapidly on the Pacific coast, and its general distribution is directly opposite to that of the preceding month, and to the present distribution of pressure on the Atlantic coast.

In the following references to longitude, that of Washington is used in determining the location of storm-tracks, and that of Greenwich in fixing the location of vessels furnishing marine observations.

Areas of Low Barometer.—The progressive movement of each of the barometric depressions marked on the tri-daily weather maps during the month is shown on Chart No. I; from which it will be seen that the region of greatest storm-frequency extends from the upper Mississippi valley eastward to the Atlantic coast, including the territory lying between the forty-fifth and fiftieth degrees of latitude. Although these depressions have occurred more frequently in the northern portion of the country, the most severe storms of the month are traced to the lower latitudes. Those marked as Nos. II and VIII, developing south of the thirtieth parallel, were probably tropical storms, which, in their progressive movement, had passed beyond the most westerly point of their curvilinear course near the northern limit of the torrid zone, and were on their return track when first observed.

An examination of the meteorological records of this office for this and previous years, indicates that the most severe storms which occur within the United States in December, originate south of the mean track of areas of low barometer, and that the severity of these storms depends largely upon the latitude of their origin, and upon the magnitude of the angle which the general direction of the course makes with the parallels of latitude. As in December of 1873, twelve barometric depressions have been traced upon the chart, and a detailed description of each is given below in the order of occurrence.

No. I. First observed in latitude 45° N., longitude 27° W.; last observed in latitude 51° N., longitude 10° E.; time of transit, forty hours; mean velocity per hour thirty-one miles. Twenty-four hours previous to the cyclonic movement of the winds produced by this depression, the barometer was decidedly above the mean in eastern and southern portions of the United States, and below the mean in the upper Mississippi and Missouri valleys. At 11 P. M. of the 1st instant, the centre was near the western boundary of Dakota, from which point it advanced over the northern portion of the United States into Canada, producing brisk and high winds in the Lake region, which veered gradually from the east to the south and west, with increasing force. The area of rain, which includes only those stations south of the storm-centre, extended from Lake Superior to Tennessee, and thence eastward to the Atlantic.

No. II. First observed in latitude 30° N., longitude 28° W.; last observed in latitude 44° N., longitude 17° E.; time of transit sixty-four hours; mean velocity per hour, twenty-eight miles. This depression moved from western Texas to the lower Mississippi valley during the 5th, accompanied by very heavy rain in the southwest. Until the morning of the 6th its course was approximately east, and its velocity per hour, twenty-four miles. Its course changed from east to northeast near the mouth of the Mississippi river, passing

over the Gulf and South Atlantic States, off the middle Atlantic coast with increasing velocity and rapidly falling barometer. Marine reports show heavy gales south of Cape Hatteras on the 5th, in latitude 37° N., longitude 73° W. This storm was followed on the 6th by a decided fall in the temperature, and a rapid rise in the barometer, accompanied by a "norther" on the coast of Texas.

No. III. First observed in latitude 51° N., longitude 15; last observed in latitude 44° , longitude 17° E.; time of transit, fifty-six hours; mean velocity per hour, twenty-four miles. This depression appeared immediately after the development of storm No. II, and both depressions moved toward the Atlantic coast on converging lines, which apparently united near the fortieth parallel on the afternoon of the 7th, after which there appears to have been but a single depression, which moved to the northeastward. The area of precipitation from the two preceding storms includes the entire country east of the Mississippi river. Southerly gales, reported from latitude 37° , longitude 73° W. from Greenwich, would indicate that this depression passed off the immediate coast as a separate and severe storm.

No. IV. First observed in latitude 48° , longitude 28° W.; last observed in latitude 49° , longitude 18° E.; time of transit, sixty-four hours; mean velocity per hour, twenty-six miles. This depression moved to the Atlantic coast between the parallels of forty-five and fifty, moving to the northeast until it arrived near Lake Superior, and afterwards following the general course of the Great Lakes and the St. Lawrence valley. Light rain preceded, and snow followed, this depression in the regions north and northeast of the Ohio valley, and the temperature fell below freezing at stations as far south as the thirty-fifth degree of latitude. The winds veered to the south and west, increasing to gales at a portion of the Lake stations.

No. V. First observed in latitude 50° , longitude 19° W.; last observed in latitude 51° , longitude 10° E.; time of transit thirty-two hours; mean velocity per hour, twenty-three miles. This depression approached the Upper Lake region from British America, and was at no time wholly within the limits of the stations of observation. It produced no disturbance south of the Lake region, and its course seems to have changed abruptly from southeast to northeast at a point immediately north of Lake Huron. High winds occurred on the northern shores of Lakes Erie and Huron when the centre of this depression had arrived at its most southerly point.

No. VI. First observed in latitude 44° , longitude 25° W.; last observed in latitude 46° , longitude 15° E.; time of transit fifty-six hours; mean velocity per hour, twenty-six miles. This depression moved rapidly to the Mississippi valley, and its centre was a well-defined depression in northern Illinois on the morning of the 13th; from which point the course of progression was north of east, passing over the Lower Lakes and off the New England coast. After passing to the east of the Mississippi valley, the central area appeared in the form of an elongated ellipse, with the major axis parallel to the equator. This form was continuous while it remained visible, the central figure growing larger and the depression diminishing as the storm moved to the eastward with increasing velocity. The storm became more severe as it approached the coast, and was accompanied by snow, sleet and rain, in a greater portion of the country. High northerly winds prevailed in the Lake region, and several wrecks occurred on the Atlantic coast north of Cape Hatteras. An area of decidedly high barometer, accompanied by very cold and clear weather, followed immediately in rear of this storm from the northwest.

No. VII. First observed in latitude 46° , longitude $22^{\circ} 30' W.$; last observed in latitude 47° , longitude $18^{\circ} E.$; time of transit sixty-four hours; mean velocity, twenty-four miles per hour. Previous to the formation of this depression in the northwest, the barometer continued below the mean in this region and the adjoining districts. This depression moved to the eastward over the Lake region and the St. Lawrence valley, producing no unusual disturbance within the United States. It increased in severity after passing to the northeastward, and marine disasters are reported to have occurred in the Gulf of St. Lawrence. When the centre was near Sydney, the barometer at that station indicated 29.07 inches.

No. VIII. First observed in latitude 25° , longitude $18^{\circ} W.$; last observed in latitude 38° , longitude $11^{\circ} E.$; time of transit sixty-four hours; mean velocity, twenty-five miles per hour. The north and east winds which prevailed on the Gulf coast during the afternoon of the 18th were the first indication of the approach of this depression from the south. The succeeding reports showed that northerly and easterly gales prevailed near the Texas coast, and on the morning of the 19th it was a well-defined tropical storm, central in the lower Mississippi valley. As in most storms which originate in the lower latitudes, the progressive movement of the centre was retarded or nearly uniform, until it had taken the northeasterly course, when the progressive velocity increased with each tri-daily report. This was decidedly the most severe storm of the month, and the region of dangerous winds extended from Lake Michigan to the Gulf and South Atlantic coast. The changes in temperature were marked and sudden on the opposite sides of this depression, which passed over the Atlantic coast south of the Middle States, producing northeast and northwest gales in the northeastern portion of the United States, and southerly gales south of Cape Hatteras. During its entire course, this depression was accompanied by heavy precipitation, rain, sleet and snow falling at the stations north of the thirty-fifth parallel. The following reports from marine records will serve to determine the general direction and extent of this storm after it had passed beyond the stations above mentioned:

On Dec. 20, latitude $37^{\circ} 30'$, longitude $74^{\circ} 30' W.$, revolving hurricane N. E. veering to N. W.

On Dec. 21st, latitude 35 deg. 20 min., longitude 71 deg. 30 min. W., severe gales from S. veering to N., terrific force from W. N. W.; (23d, 3.30 A. M., furious gusts, barometer 29.42, temperature 72) deg.

On Dec. 20, latitude 38 deg. 30 min., longitude 74 deg. 10 min. W., a violent gale from N. E.

On Dec. 26, latitude 41 deg. 51 min., longitude 63 deg. 5 min. W., schooner Maria seen with loss of deck load and leaking.

On Dec. 20th and 21st, latitude 35 deg. 29 min., longitude 74 deg. 40 min. W., heavy S. E. gale veering to N. W.

On Dec. 20, latitude 35 deg. 41 min., longitude 74 deg. W., severe gale from all points, twelve hours.

Vessel from Wilmington, N. C., to Liverpool, arrived Dec. 26, had bulwarks stove and cabin damaged.

On Dec. 24, latitude 40 deg., longitude 67 deg. 30 min. W., N. W. gale with tremendous sea, twenty-four hours.

On Dec. 25, latitude 45 deg. 07 min., longitude 53 deg. 49 min. W., W. S. W. heavy gales.

No. IX. First observed latitude 47 deg., longitude 27 deg. 30 min. W.; last observed latitude 48 deg., longitude 6 deg. W.; time of transit, forty hours; mean velocity per hour, eighteen and three-quarter miles. This depression appeared in the extreme northwest, before the preceding storm had passed beyond the East Atlantic coast. An examination of the weather maps shows that, for several days previous to the appearance of this depression, the barometer was decidedly high on the Pacific coast, and furnishes no trace of this depression west of the Rocky Mountains. It was irregular in form, and produced no marked disturbance within the limits of the United States, although the area of precipitation extended southward to the Ohio valley.

No. X. First observed latitude 49 deg., longitude 25 deg. W.; last observed latitude 47 deg. 30 min., longitude 17 deg. E.; time of transit, fifty-six hours; mean velocity, twenty-six miles per hour. This appears to have been a secondary depression following immediately in the rear of the preceding, and becoming defined as a storm-centre on the afternoon of the 22d in Manitoba, after which it developed into a storm which extended from the Mississippi valley eastward to the Atlantic coast, producing high winds in the Lake region, and finally passing to the southeastward over the Middle and New England States to the Atlantic, where it curved again to the northeastward.

No. XI. First observed latitude 45 deg., longitude 22 deg. W.; last observed latitude 47 deg., longitude 2 deg. W.; time of transit, forty hours; mean velocity, twenty miles per hour. Although the centre of this depression could not be located before the midnight report of the 24th, there were indications that it passed from the Pacific coast north of Oregon, crossing the Rocky Mountains near Virginia City. It was but a slight depression, and produced no marked disturbance.

No. XII. First observed latitude 45 deg., longitude 12 deg. W.; last observed latitude 50 deg., longitude 15 deg. E.; time of transit, thirty two hours; mean velocity per hour, thirty miles. The stations in the Mississippi valley, and those in the territories east of the Rocky Mountains, indicated an extensive barometric depression without a cyclonic movement of the winds on the morning of the 27th. At the afternoon report, an extensive trough of low barometer extended from Lake Superior southwestward to Texas. The low barometric readings reported from Santa Fé, and the direction of winds at neighboring stations, taken in connection with reports from San Diego, would indicate that this storm passed from the regions of these stations.

Areas of High Barometer.—The progressive movements of these areas have been traced in a manner similar to that followed in tracing the tracts of the centres of low barometer. These tracts are given on Chart No. II in red, from which it will be seen that the mean direction of these areas is from the northwest toward the South Atlantic coast. They have uniformly been accompanied by low temperature, and in the latter portion of the month by decidedly cold weather. The occurrence of increased barometric pressure in the northwest was followed by a "norther" on the coast of Texas, or in the Southwest, on the 6th, 14th, 17th, 20th, 24th, 29th, and 31st, and in some instances warnings of the approach of these storms appeared in the daily weather reports from this office. The most interesting are those which immediately preceded and followed the storm of the 13th and 14th, each originating in the northwest beyond the limits of our stations, and extending over the entire country east of the Rocky Mountains before disappearing off the South Atlantic coast.

No. VIII passed directly to the southward west of the Mississippi river, and thence to the eastward, following immediately in the rear of storm No. VIII. This deflection

from the usual course, when considered in connection with the tropical storm which preceded it, is suggestive and interesting.

No. XII was decidedly the most extensive of the month, and was attended by a continuous flow of cold northerly winds towards the Gulf, producing a rapid change of temperature in all the districts, and continuous rains in the Southern States during the latter portion of the month.

ATMOSPHERIC TEMPERATURE.

The mean temperature of the month is shown by the isothermal lines on Chart No. II. It differs but slightly from that of December, 1873, and has been from one to five degrees above the mean of the month, in the districts of the United States east of the Territories. The low temperature in the St. Lawrence valley is probably due to the relative distribution of atmospheric pressure, as the area of low barometer which developed rapidly in the North Atlantic during the month produced north and west currents, passing over this region from higher latitudes, around the west side of this depression. Reports from New Mexico show that the temperature has been lower than for many years, and that this extreme cold has been accompanied by heavy snows in the valley of the Rio Grande as far south as the northern boundary of Mexico.

PRECIPITATION.

The distribution of rain and melted snow is shown by the isohyetal lines on Chart No. III, and the amount of precipitation during the month in the several districts, as compared with the mean deduced from several years, is given in the table. It will be seen that there has been a deficiency in precipitation in nearly all the districts east of the Mississippi river and in the Northwest, and a large excess in the Southwest. There has been an excess of cloudiness in the regions north of the Eastern Gulf States, and the number of days on which rain or snow has fallen is unusually large in comparison with the amount of precipitation.

WINDS.

The mean direction of the winds at the several stations of the Signal Service is shown on Chart No. II. The total atmospheric movement for the month, independent of direction, has been as follows at the stations named below:

Boston	6,393 miles.	St. Louis.....	7,107 miles.	Detroit.....	6,282 miles.
Baltimore.....	4,657 "	New Orleans....	5,506 "	Chicago.....	7,341 "
Buffalo.....	8,670 "	Albany.....	7,618 "	Memphis.....	3,500 "
Cleveland.....	8,032 "	New York.....	7,090 "	Charleston.....	5,158 "
Cincinnati.....	5,187 "	Pittsburgh.....	4,986 "		

Among the maximum total movements the following are noted :

Erie.....	12,260 miles.	Sandy Hook.....	11,993 miles.
Cape Hatteras.....	9,323 "	Grand Haven.....	9,280 "

The winds have been light at the following stations : Augusta, Ga., total movement, 2,494 miles ; Lynchburg, 2,809 ; Nashville, 3,406.

A velocity of one hundred miles per hour occurred at Mt. Washington on the 12th.

CAUTIONARY SIGNALS AND VERIFICATION OF PREDICTIONS.

During the month ninety-eight Cautionary Signals were displayed at the stations in the United States, and thirty-six storm-warnings were sent to the Canadian stations.

Eighty-eight and seven-tenths per cent. of those ordered for the stations of the Signal Service were justified by the occurrence of dangerous winds within one hundred miles of the signal. The signals at Wilmington and New London were of special value, as they prevented vessels from going to sea immediately preceding the storm of the 20th.

Probabilities.—A critical comparison between the predictions published in the tri-daily probabilities and the subsequent weather reports, shows that on the average, during the month, ninety-four and four-tenths per cent. of the predictions have been well verified.

NAVIGATION.

The condition of the rivers during the month is given in the table on Map No. III, from which it will be seen that the Red river rose slowly but steadily at Shreveport during the greater portion of the month, and recent reports from points above Shreveport show a sufficient depth of water for navigation. The Missouri river was closed throughout the month at Fort Sully and Yankton, and after the 9th at Omaha. The heavy rains which attended the storm No. VIII in the Tennessee, Ohio and Cumberland valleys, caused a considerable rise in these rivers, beginning on the 20th. These freshets had partly subsided before they were reinforced by the still greater rise of the 28th and 29th. No important change occurred in the Mississippi river until the 23d, when the freshets from the Ohio and the Cumberland caused a rise of ten feet at Cairo, the freshet wave reaching Memphis on the 25th, and Vicksburg on the 29th. At St. Paul and La Crosse the river remained closed during the entire month.

Navigation closed at a greater portion of the Lake ports between the 1st and the 10th of the month. The Erie canal was closed on the 5th.

TEMPERATURE OF WATER.

The table on Map No. II, gives the maximum and minimum temperature of water at many of the Signal stations on the lakes, rivers, Gulf and South Atlantic coasts. The range of water temperature in the rivers and lakes located in the central and northern sections of the country is small, as the temperature of water was comparatively, near the freezing point at the beginning of the month. In the southern rivers, and on the Atlantic and Gulf coasts, the range has been larger, and a comparison of the mean temperature of water with the mean atmospheric temperature, shows that the temperatures of the air and water have differed but little, the air being slightly cooler. The only instance where the water has been colder than the air is at St. Louis, where the winds have been southerly during the greater portion of the month. In the lakes, and on the coast of New England, the mean temperature of the air has been much lower than that of the water, the greatest observed difference being 17 degrees at Eastport, 10 degrees at Portland, 9 degrees at New London, 14 degrees at Duluth, and 11 degrees at Marquette.

ATMOSPHERIC ELECTRICITY.

Thunder and Lightning.—The thunder-storms which have occurred during the month in the southern portion of the country were uniformly in the vicinity of areas of barometric depression. Those accompanied by the most vivid displays of lightning were as follows: At Montgomery, zig-zag lightning on the 3d; at Indianola and Fort Gibson on the 4th; at Charleston on the 7th; at Galveston on the 17th, 19th and 25th; at Cape Hatteras on the 20th; at Corsicana, Texas, on the 28th.

Auroras.—The auroral displays, although not noticeably brilliant, have occurred more frequently during this than during the preceding month. The following are cited as the most interesting: Those of the 1st, 3d, 6th and 15th, at New London; 6th, 15th and 21st, at Keokuk; 3d, 13th, 20th and 21st, at Wood's Hole; 3d at Alpena, Escanaba and Cornish, Me., very brilliant; an auroral arch was visible at Auburn, New Hampshire, and Woodstock, Vt., on the 21st.

OPTICAL PHENOMENA.

Solar Halos.—The only days on which solar halos have not been reported at some one of the regular stations, during the month, are the 3d, 4th, 7th, 8th, 14th, 21st, 28th and 29th. Those most extensively observed were reported on the 5th at New London, Alto Vista, Va., Andover, Mass., Standish, Me., Florida, Mass., Auburn, N. H., Contoocookville, N. H., Cornish, Me. On the 10th at Ephata, Penn., Standish, Me., and Cornish, Me. On the 15th at Point Pleasant, La., and Newburyport, Mass. On the 18th at Tioga, Pa., Point Pleasant, La., and Milton, Mass., (parhelias,) and Wilsonville, Ala. On the 19th at Jacksonville, Tenn., Afton, Iowa, and Hennepin, Iowa.

Lunar Halos.—These have been unusually numerous during the latter portion of the month; those occurring on the 16th, 17th, 18th, 19th, 20th, 22d and 23d, were extensively observed, and are of especial interest when considered in connection with the storm of the 19th and 20th.

Mirage.—Observed on Lake Superior, near Duluth, on the 15th.

MISCELLANEOUS PHENOMENA.

Meteors were observed on the 5th at Andover, Mass., and Afton, Iowa. On the 8th at Williamsport, Penn.; Fall River, Mass., Woodstock, Vt., Corning, Mo., and Council Bluffs, Iowa. On the 12th at Milford, Del., Fort Madison, Iowa, Fort Wayne, Indiana, (brilliant,) and Woodstock, Vt. December 2d at Shreveport, La., (brilliant, exploding, with blue and yellow light.)

Fires.—Prairie fires were reported to the west of and near to North Platte station on the 3d and 8th, burning towards the north. Forest fires on the 12th, east of Shreveport.

Earthquakes.—Distinct shocks occurred at 10.15 P. M. on the 10th on Long Island, in Westchester and Rockland counties, along the Palisades and Hudson river, N. Y., and in New Jersey. Also on the 12th, between 10 and 11 P. M., a slight shock of earthquake was felt at Garrisons, New York; also at Guadeloupe W. I., at 11.50 A. M., on the 8th

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Brig. Gen. (Bvt. Assg'd.) Chief Signal Officer, U. S. A.

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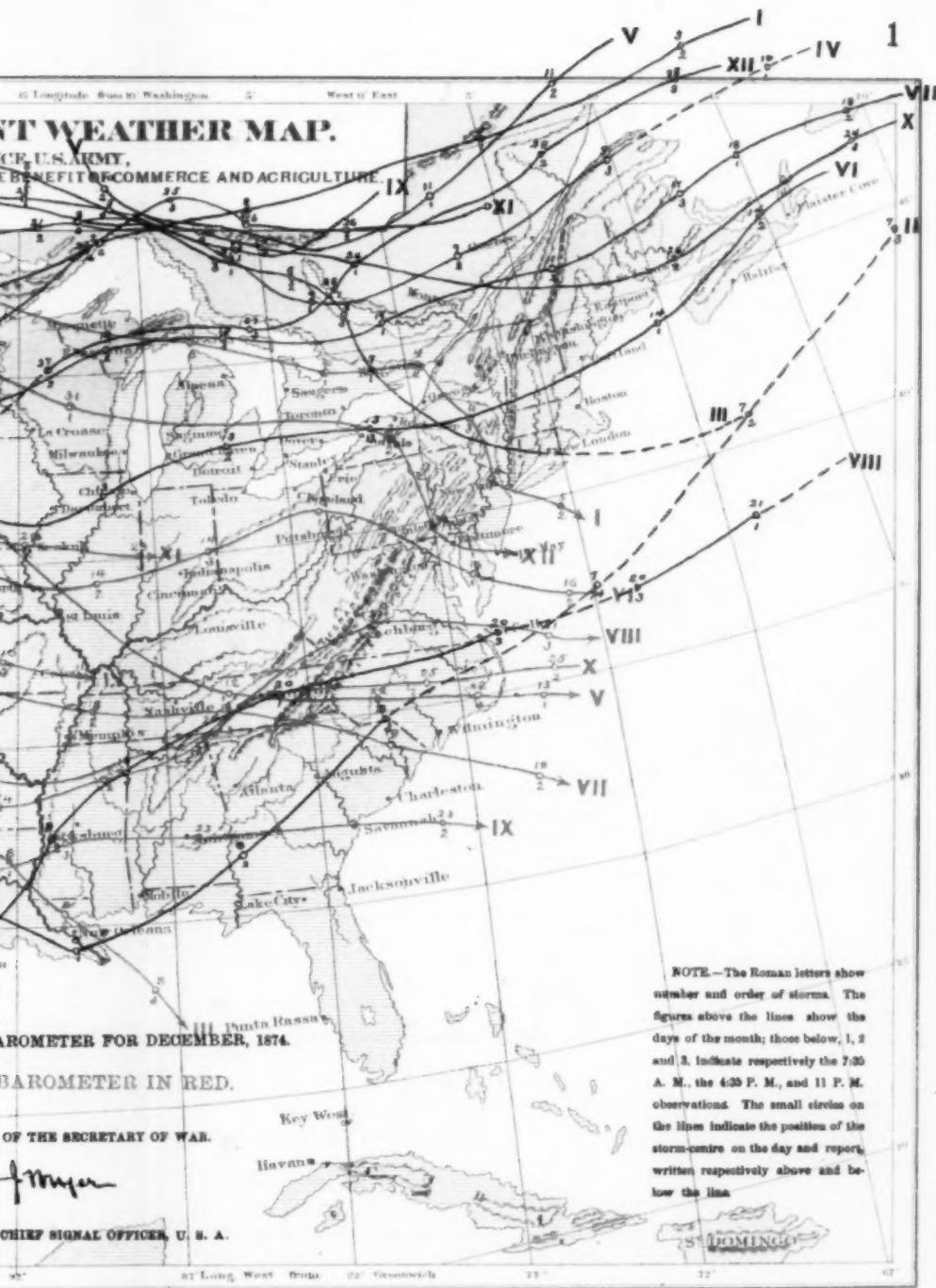


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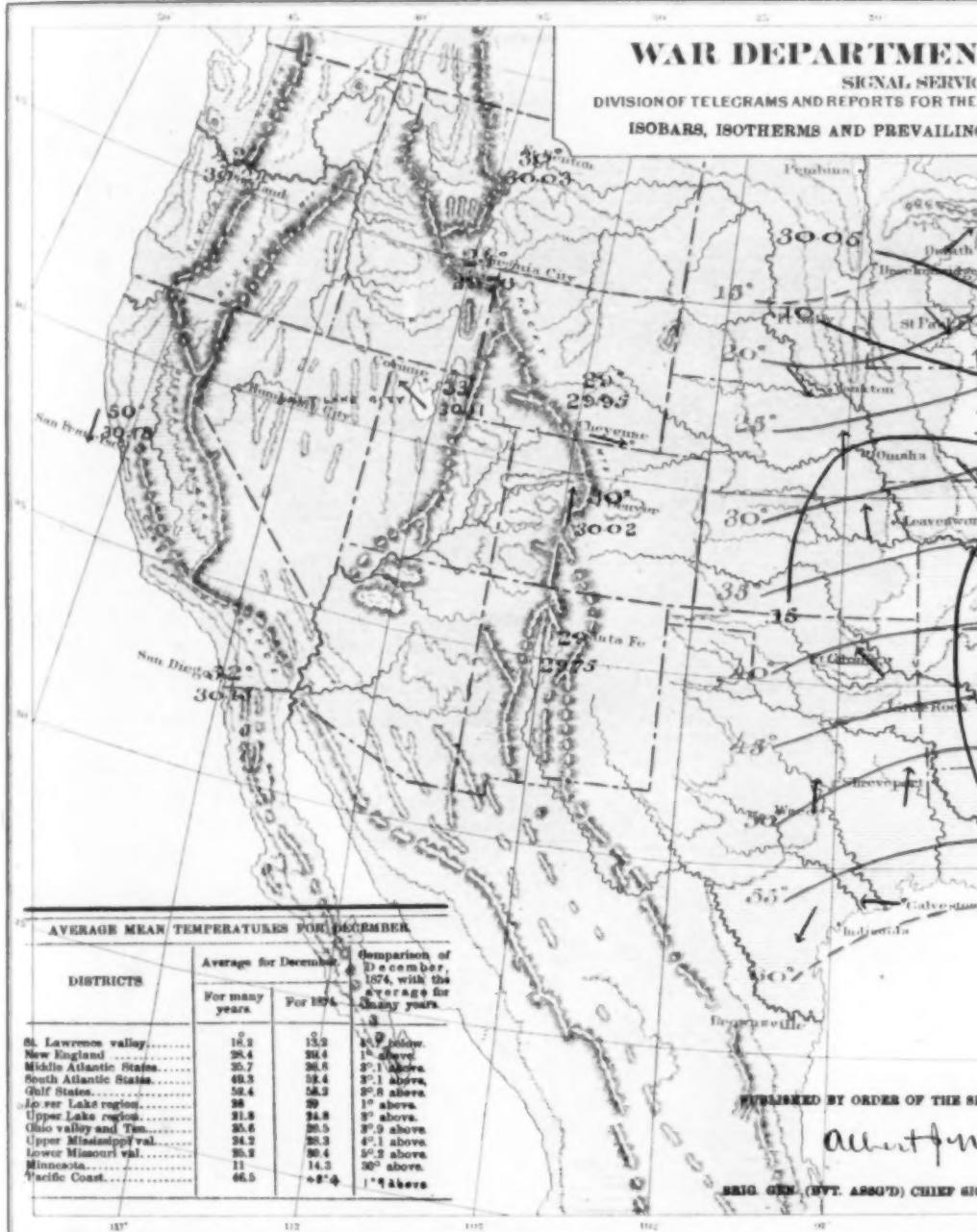


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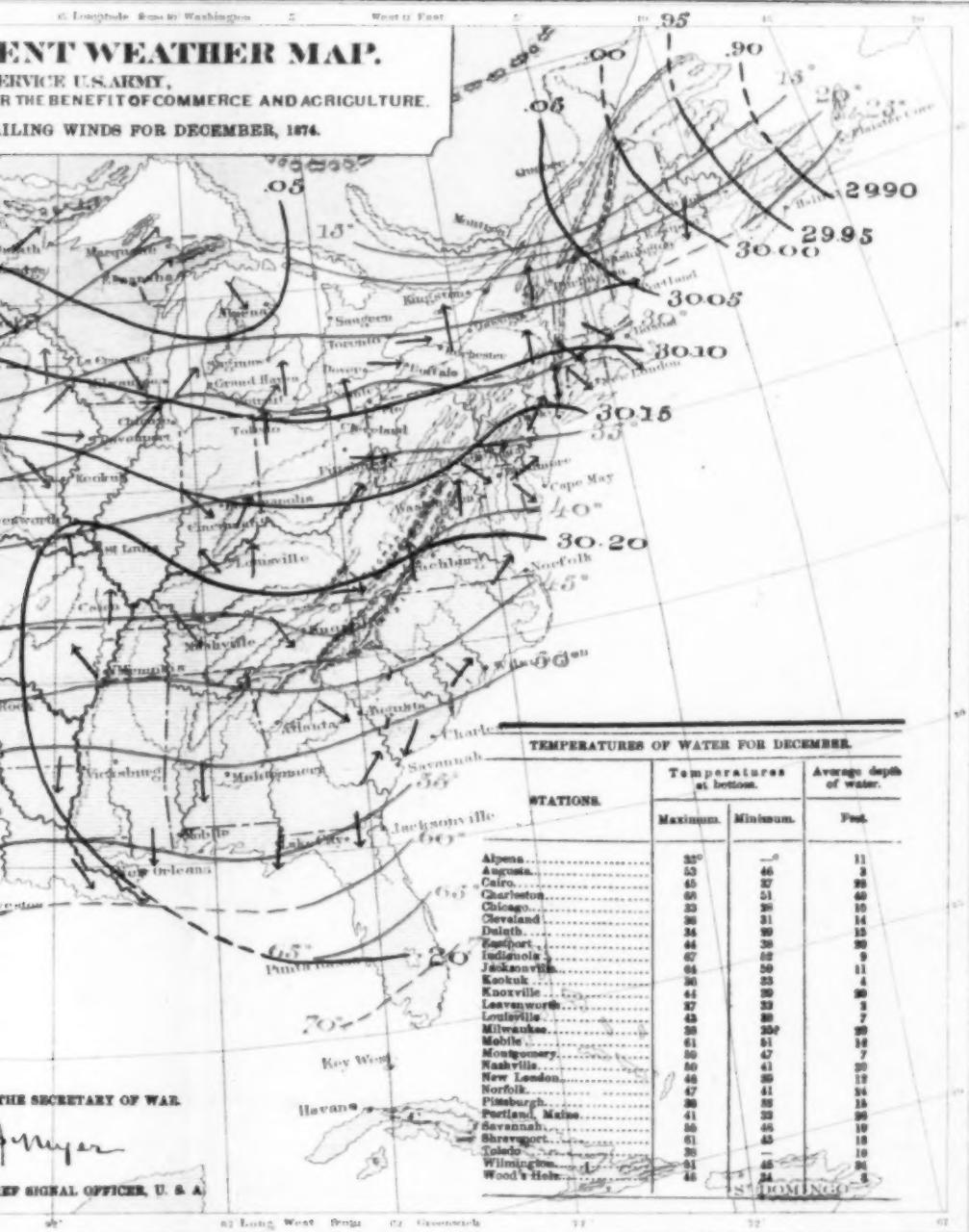
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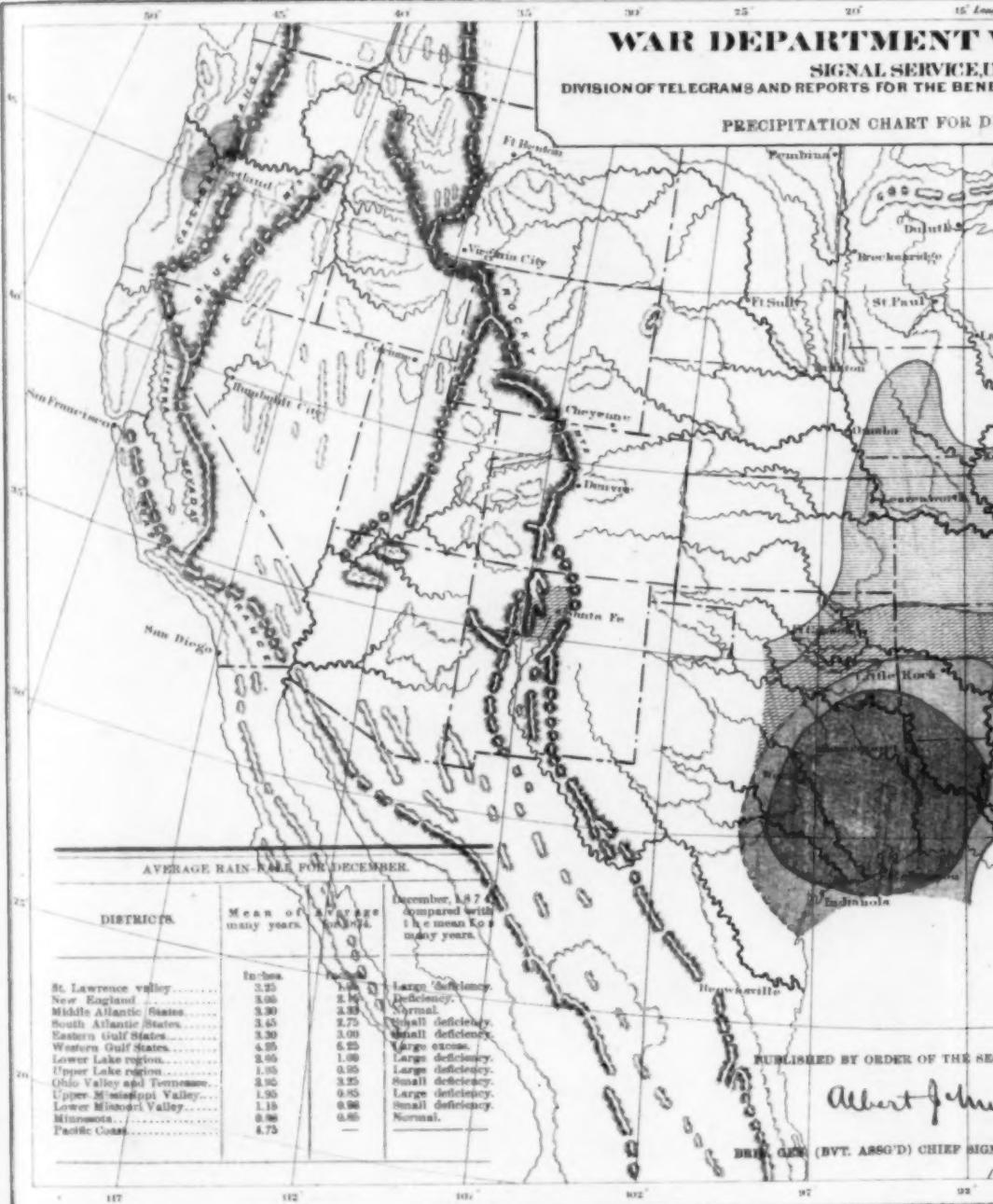


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PRECIPITATION CHART FOR DECEMBER



No. III.

